Device and method for detachably fixating an object

Field of the invention

The invention relates to a device for detachably fixating a first object, e.g. a foldable car seat in folded position, to a second object, e.g. a vehicle, the device comprising an elastic cord. The invention further relates to a method for the manufacture of such a device.

Description of the Prior Art

Devices are known for detachably fixating a first object, such as a folded car seat, to a second object, such as a vehicle. These can be found amongst others in an 'SUV' ('sports utility vehicle') where it is important that a foldable seat remains fixated in the folded position at all times, also in case of a collision. Consequently, there are stringent requirements to the solidity and reliability of the device. Often the fixation is done by means of a device comprising an elastic element or elastic cord. Such an elastic cord is generally composed of a bundle of elastic strands, covered by a sheath. The strands provide the elasticity to the cord, while the sheath determines the eventual strength of the cord.

The elastic element or elastic cord should be connected to fastening means such as hooks or anchors. Several solutions are known for the connection between an elastic cord and a fastening means. Often a so-called hog ring is used, around which the end of the elastic cord is folded in a loop, optionally followed by insert moulding with a plastic. However, such a connection is laborious and bulky. It is therefore relatively costly, it can only be manufactured by a skilled person using special tools, and it cannot be used when there is little space available. Furthermore, use is made of a tubular element which is 'shrunk' around the end of the elastic cord. Although less bulky, this type of connection is relatively expensive and laborious. On top of that, the elastic cord, both when using a hog ring or a tubular element, tends to wriggle itself loose, which reduces the solidity and reliability of the connection. Devices according to the state of the art therefore have one or more of the following disadvantages: lack of strength, solidity and reliability; expensive, laborious and can only be manufactured by skilled staff using special tools; relatively bulky.

When the elastic cord is applied and tightened, relatively much pulling force is needed to securely locate the first object. This can pose large problems, especially for elderly or weak

persons. The final tension in the cord should however be high to secure the object, also in case of strong forces being exerted e.g. during strong breaking or collision of a vehicle. Therefore a need exist for a solution whereby the required force for, at least as large as possible a part of, the tightening process is limited.

The purpose of the present invention is to provide an improved solution for detachably fixating a first object, such as a folded seat, to a second object, such as a vehicle, which solution avoids the abovementioned drawbacks of devices and methods of the prior art.

Summary of the Invention

To this end, the invention provides a device of the type outlined in the preamble, characterised in that the elastic cord (4) is connected, at at least one position, to a fastening means (6,7) by means of at least one pin (5), which pin (5) at least partially pierces the elastic cord (4) and preferably has a diameter of at most several millimetres. Such a connection proves to be very strong. The elastic cord (4) cannot work itself loose like with the known devices. Extra parts such as a hog ring or a tubular element are not necessary. Consequently, the space taken up is minimal and the dimensions of the fastening means (6,7) can be kept as small as possible. The pin (5) is preferably produced from steel, for example steel with hardness 60+/-2 HRC, spring steel 55 SI 7 or Ck67, or high end machine steel 9 SMn Pb 28 K. Steel is strong, so large forces can be accomodated using a small diameter pin (5). The pin (5) may be cylindrical, a C-pin, a 'kerfpen' or even a common nail, if sufficiently strong. A pin (5) with a small diameter of several millimetres maximum can be put through the elastic cord (4) without damaging the strands. The elastic cord (4) can be reinforced, at the position of the connection with the fastening means (6,7), e.g. by means of an additional wrapping or a sheath. This further strengthens the connection.

The fastening means (6,7) can comprise a hook (6), which e.g. can be attached to one of the supports of a headrest (9) in a vehicle (3).

When stretched, the first end of the elastic cord (4) can thus be attached simply to e.g. the supports of a headrest (9). The fastening means (6,7) can also comprise an anchoring means (7) which e.g. can be mounted on the first object (2) or the second object (3). A second end of the elastic cord (4) can thus be connected to e.g. a foldable car seat (2). This way, by

means of the elastic cord (4) a foldable car seat (2) can be fixated in folded position in a vehicle (3). The anchoring means (7) can of course also be mounted elsewhere, e.g. on the second object, e.g. on the floor of a vehicle (3).

Preferably the device also comprises a resilient structure (10), which works serially with the elastic cord (4) within a given range of tensile force, the resilient stiffness of the resilient structure (10) being substantially lower than the resilient stiffness of the elastic cord (4). Distending the assembly of elastic cord (4) and resilient structure (10) up to a certain total stretch can thus be done with relatively little effort, so the first part of tightening the elastic cord (4) is relatively easy. Next the final phase of the tightening can be done with a relatively large pulling force, so the fixated object is held in place with sufficient force.

Preferably the device also comprises a deformable element (11), which deformable element (11) deforms if the tensile force in the elastic cord (4) exceeds a certain threshold value. The extent of the deformation of the deformable element (11) can depend on the value of the tensile force in the elastic cord (4). The deformation can be elastic or non-elastic. When the threshold value is exceeded, the deformable element (11) can thus absorb a part of the tensile force and (kinetic) energy, for example during strong braking or a collision, so the chance of overload of the elastic cord (4) and other parts (5,6,7) of the device decreases. Furthermore, in case of permanent deformation it can be deduced later how strong the tensile force was at most, which can be used as evidence in case of a claim for damage. Preferably the anchoring means (7), the resilient structure (10) and the deformable element (11) are produced integrally.

Furthermore the invention provides a method of the type mentioned in the preamble, characterised in that the elastic cord (4) is connected, at at least one position, to a fastening means (6,7) by at least partially piercing the elastic cord (4) with at least one pin (5), the pin (5) preferably having a diameter of at most several millimetres. Such a method is simple and efficient, and can even be performed by an unskilled end-user, without special tools. The elastic cord (4) can be cut to a desired length for a particular application and then be pierced with the pin (5). The elastic cord (4) can be reinforced, at the position of the connection with the fastening means (6,7), e.g. by an extra wrapping or a sheath. This yields an even stronger connection.

Preferably a hook (6) is used as a fastening means (6,7), which hook (6) can e.g. be attached to one of the supports of a headrest (9) in a vehicle. Also an anchoring means (7) can be used as a fastening means (6,7), which anchoring means (7) can be mounted e.g. on the first object (2) or the second object (3). Thus a device can be produced with which for example a foldable car seat in folded position can be fixated to a vehicle.

Preferably, in the device is also taken up a resilient structure (10), which resilient structure (10) works serially with the elastic cord (4) within a given range of tensile force, the resilient stiffness of the resilient structure (10) being substantially lower than that of the elastic cord (4). As stated previously, stretching the assembly of elastic cord (4) and resilient structure (10) to a given total stretch can be performed with relatively little pulling force, and the final tightening can be done with a relatively strong pulling force, thus assuring that the fixated object is held in place with sufficient force.

Preferably a deformable element (11) is also included in the device, which deforms if the tensile force in the elastic cord (4) exceeds a certain threshold value. The deformable element (11) can be produced in such a way that the deformation of the deformable element (11) depends on the value of the tensile force in the elastic cord (4). As stated previously, when the threshold value is exceeded, the deformable element (11) can thus accommodate a part of the tensile force and absorb (kinetic) energy. In case of permanent deformation it can later be deduced what was the maximum value of the tensile force.

Description of Preferred Embodiments

The invention will be illustrated in the following by means of a number of non-limiting embodiments of a device according to the invention.

It is shown in:

figure 1a: a perspective view of a car seat in the folded position provided with a device according to the invention;

figure 1b: a perspective view of fixating the folded car seat;

figure 2: a perspective view of a first preferred embodiment of a device according to the invention;

figure 3: a resilient structure according to the invention;

figure 4a: a view of an anchoring means integrated with a resilient structure according to the invention and a deformable element according to the invention;

figure 4b: a partial cut-out view of said anchoring means, and

figure 5: a perspective view of a second preferred embodiment of a device according to the invention.

Figure 1a shows a folded car seat (2) that has yet to be fixated in a vehicle (3) provided with a device according to the invention. Figure 1b shows how a hook (6) connected to an elastic cord (4) is hooked around one of the supports of a headrest (9) in a vehicle (3).

Figure 2 shows an elastic cord (4) that has been connected at both ends by means of a pin (5) to a hook (6) and an anchoring means (7) respectively. The anchoring means (7) can e.g. be mounted on a foldable seat (2). The thin pins (5) are simply put through the elastic cord (4) whereby the individual strands are not damaged.

In figure 3 a resilient structure (10) according to the invention has been depicted. The resilient structure (10) has a substantially smaller resilient stiffness than that of the elastic cord (4). The elastic cord (4) is connected by means of a pin (5) to an end part (12) provided for this purpose, and thus also to an anchoring means (7). The assembly of elastic cord (4) and resilient structure (10) can now during application and tightening be stretched with a relatively small pulling force till the end part (12) hits the anchoring means (7). Then the total resilient stiffness equals the relatively large stiffness of the elastic cord (4), so the object involved can be tightly fixated.

Figure 4 shows an anchoring means (7) integrated with a resilient structure (10) according to the invention and a deformable part (11) according to the invention. The tightening and stretching of the assembly of elastic cord (4) and resilient structure (10) will at first be relatively easy, until the pin (5) touches the deformable part (11). From then on the stretching will be more difficult and the object concerned can be fixated. When the tensile force in the elastic cord (4) then exceeds a certain threshold value, as would happen in a collision, the deformable part (11), in this embodiment being a weakening in the wall of the anchoring means (7), would be deformed. This way a part of the tensile force and (kinetic) energy will be absorbed by the deformable part (11), so the overload of other parts is

reduced. Afterwards it can be estimated, by means of the indicator marks (13), what has been the maximum value of the tensile force on the elastic cord (4). For this purpose, the deformable part (11) in this embodiment increases in diameter and therefore strength, in the direction of the tensile force.

Finally, figure 5 represents an embodiment consisting of an elastic cord (4) connected at both ends to a hook (6). An end user could purchase the assembly in parts, and simply trim the elastic cord (4) to size by cutting it at the desired length. Next, the elastic cord (4) trimmed to size can be connected by means of the pins (5) to the hooks (6), without special tools. Thus an unskilled person can simply and quickly make a solid and reliable device for detachably fixating an object, as a made to measure solution for his own specific application. Applications for leisure or sports such as the fixation of a canoe or luggage on or in a vehicle, vessel or aircraft can be imagined.

Thus it will be clear that the invention, although mainly discussed by means of the fixation of a folded seat in a car, can also be applied to the fixation of any other objects to each other.